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ABSTRACT

Although results of both formative and summative evaluation can be used for planning the next generation of a curriculum, a need exists for a third kind of evaluation, namely, Pre-Planning Evaluation (PPE). The purpose of PPE is to provide a database to curriculum development deliberations to assist in decision-making and to guard against neglect of important issues. Selected findings and conclusions from three case studies (the biology curriculum in Israel, the high school biology curriculum in Australia, and the electricity curriculum in Israeli technical high schools) are presented to illustrate the nature and potential of PPE. Findings and conclusions from the PPE biology studies show that: (1) in elementary grades, the needs of individual students should take precedence over the demands of subject matter and society; (2) more emphasis should be given to human biology and its applications; and (3)continuous short time revision of laboratory manuals is very important. The electricity case study is the most comprehensive and involves data collection from 11 different populations and analyses of a variety of pertinent documents. Several curricular decisions must be made due to the PPE finding that information and techniques in electricity become obsolete in 5 to 13 years. (JN)

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The Role of Pre-Planning Curriculum Evaluation in Science Education

by

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THE ROLE OF PRE-PLANNING CURRICULUM EVALUATION IN SCIENCE EDUCATION

Purpose of Study

The purposes of the study are:

1. To propose a new dimension to curriculum evaluation designated as Pre-Planning Evaluation (PPE).
2. To provide a rationale for PPE.
3. To illustrate its potential through three case studies.

Theoretical Perspective

Two dimensions have usually been identified in curriculum evaluation, namely formative evaluation and summative evaluation (Scriven, 1977). Formative Evaluation is accomplished during the period of curriculum development and is designed and performed for the purpose of monitoring the process of development in order to improve the curriculum materials and ascertain their feasibility. Summative Evaluation is performed after the completion of the development process and aims at the assessment of outcomes and the conditions under which these outcomes are obtained. The main function of summative evaluation is to provide feedback to developers and clients and to assist potential users in making decisions related to adoption, adaptation and implementation of a given curriculum. Although results of both formative and summative evaluation may be used for planning the next generation of curriculum in a particular field, there exists a need for a third kind of evaluation, namely Pre-Planning Evaluation (PPE). Such evaluation is certainly essential when no pertinent evaluation data exist in relation to the particular curriculum to be developed. However, even for a second generation of a particular curriculum,

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relevant evaluation data are often non-existent, and even when some data of previous formative and summative evaluations do exist, their usefulness for planning for a future curriculum is often limited. The case studies which are presented below illustrate the three situations mentioned above.

The Biology Curriculum in Israel

(a new generation, previous evaluation data available)

Since the middle sixties new programs in biology have been developed and introduced to Israeli schools, beginning with the senior high school and moving down to the junior high and to the elementary schools. The development of the curricula was accompanied by intensive formative evaluation and followed by many summative evaluation studies. And yet when the time came to plan a new generation of curricula, the various development groups felt that they needed information which could not be found in existing evaluation reports. Consequently, at least three PPE studies were undertaken: one in the form of a questionnaire (Silberstein and Tamir, 1979) and two in the form of interviews with a variety of people including lay persons and experts such as scientists, science educators, teachers and others (Gotlib, 1981; Chen, 1982). For example some of the findings of the PPE based on the questionnaire study were:

1. Respondents differentiated between the needs of the individual students, the requirements of the subject matter and those of society.
2. In elementary grades the needs of individual students should take precedence over the demands of subject matter and society, focusing on the development of interests and attitudes. In higher grades the

grades 11 and 12, two laboratory manuals and a teacher's guide were produced. Since then as part of a policy of continual updating and improvement the materials, especially the laboratory manuals, were revised a number of times. Although the Australian program known as "Biological Science: the Web of Life" has become the dominant high school biology program (see Morgan, 1979) surprisingly little has been published in terms of its evaluation. In 1978 an opinion survey of biology teachers was undertaken. The purpose of this survey (Morgan and Tamir, 1985) was to obtain the opinions and perceptions of the teachers on various aspects of the program and use these opinions and perceptions as a basis for revising the learning materials, including the textbook which has been revised only once before. Hence, this survey may be regarded as PPE.

Some of the findings of this survey were:

1. The aims of the course were appropriate and their achievement with most students - feasible.
2. Principles and generalizations should be emphasized.
3. Concepts and principles should be learned in relation to the evidence on which they are based.
4. Narrative of inquiry is an appropriate and desirable way of presenting biological reading materials to students at all ages.
5. Continuous short term revision of laboratory manuals is very important. Hence laboratory manuals should be separated from the textbook.
6. More emphasis should be given to human biology and its applications.

These and other findings of the survey have served as an important basis for course revision. In fact the data provided by this survey were the only

formal evaluation available to the course developers of the materials currently used in Australia.

The Electricity Course in Israeli Technical Schools

(a new generation, no previous evaluation data)

This case study is the most comprehensive and perhaps most interesting PPE because it was followed by an experimental field study in which the actual use of PPE data by curriculum developing committees was monitored, studied and documented (Tamir, 1984). While in the case of biology in Israel a large number of evaluation studies have been carried out, no such studies exist in electricity and hence the information provided by the PPE often came as a surprise even to the teachers and inspectors in the field. The study involved 11 populations as follows:

> high school students specializing in electricity, graduates of technical high schools who had specialized in electricity, high school students not specializing in electricity, teachers of electricity, teachers of other subjects, heads of electricity departments in schools, teacher educators, electricity experts from industry, employers, school principals and inspectors.

Each of the above responded to an appropriate questionnaire and some were interviewed as well.

In addition the following documents were analyzed: electricity specialization syllabus in Israel and in other countries, learning materials in electricity, matriculation examinations in electricity (both questions and results), school tests in electricity, policy documents regarding the future of tech-

nological education and manpower prediction data for 1990's.

The results were summarized and a comprehensive report was printed and made available for curriculum deliberations. In order to facilitate the comprehension and utilization of the information, it was organized under four main categories namely: subject matter, students, teachers and society. Each issue was presented in the following manner:

tables of findings, summary of main findings, conclusions, and discussion questions. For example: How long does it take for information in electricity to become obsolete?

Kind of information	Mean length of period in years according to	
	Experts (N=27)	Employers (N=13)
Principles of the profession	13.3	13.9
Problems of the profession	8.7	9.7
Methods and approaches	6.8	8.5
Practical means and techniques	5.3	7.1
Performance of typical jobs	5.9	4.9

Summary: Information and techniques become obsolete in 5 to 13 years.

Conclusion: Much of what students will have to know and do on their job will differ form what they have studied in school.

Discussion Questions:

* What principles, problems, methods, means and techniques should be studied?
* How much time should be devoted to each of the above (theory, practice?)
* How can students be prepared for coping with the rapid change in the future?

Implications

Now that money for curriculum development is not abundant, improvement in procedures used in curriculum development to ensure high quality products is essential. PPE is a useful strategy which provides important data base for decision making. Indeed it is suggested not only that PPE will be routinely performed but also that the evaluator will be invited to participate as a member of the curriculum deliberation group. We have evidence that the provision of PPE data changes substantially the course of curriculum deliberations and guards against neglect of important issues, a neglect which can be detrimental to the new curriculum and its potential and actual contribution. More specifically it ensures a balanced treatment of subject matter, students, teachers and society.

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